Epidemiology of Rabies, Human Disease and Post-Exposure Prophylaxis (PEP)

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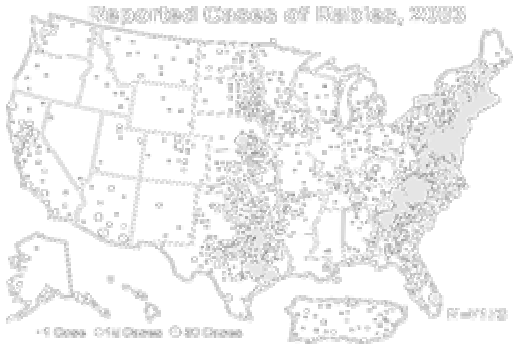
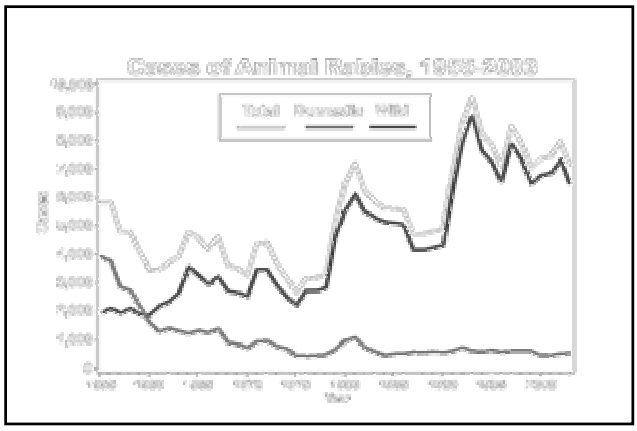
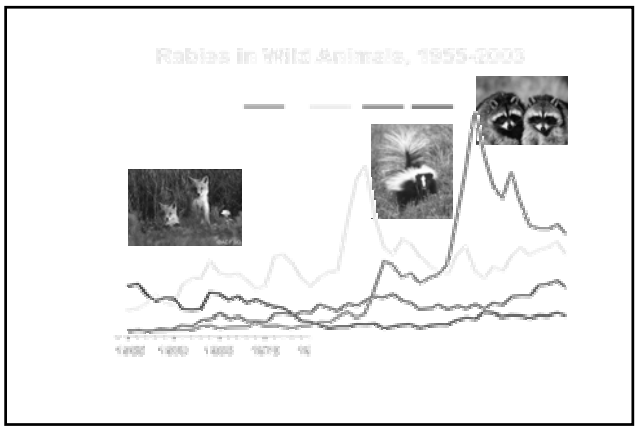
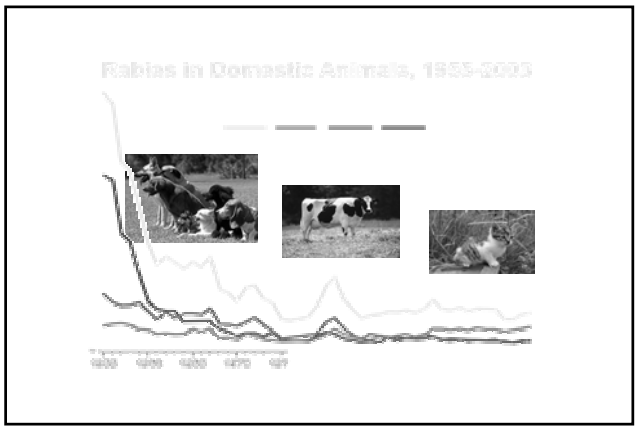
Rabies Epidemiology USA

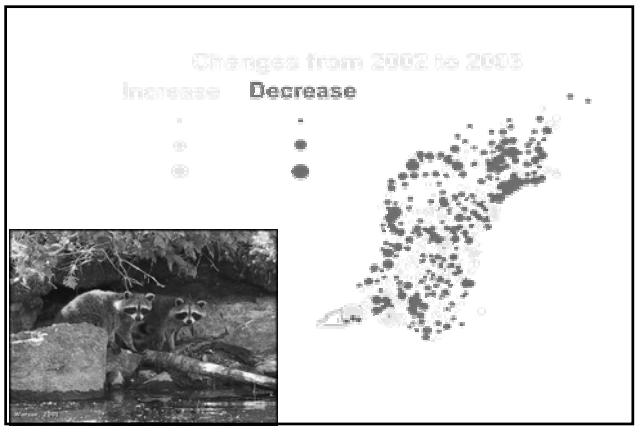


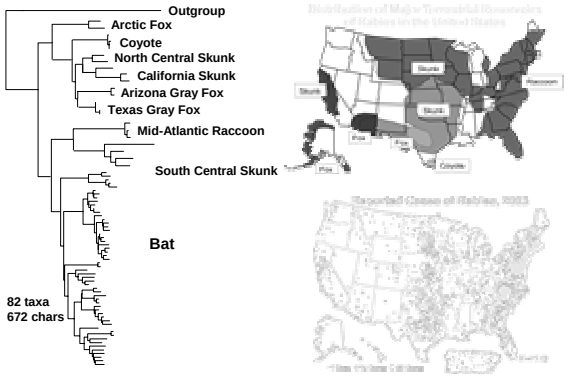
Mongoose Rabies



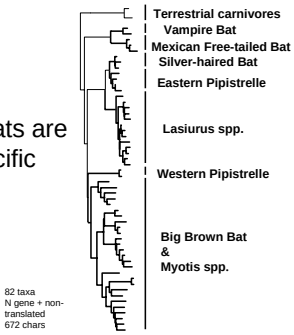

Rabies in Wild Animals, 1955-2003


Rabies in Domestic Animals, 1955-2003


Changes from 2002 to 2003
Increase
Decrease



Rabies Variants in Bats are Host-species Specific



Human Rabies Cases

Rabies in humans has been feared since ancient times.

Transmission of the disease by the bite of rabid dogs was documented in the Eshnunna code of Mesopotamia which predated the Hammurabi code (23 BC).

Although rabies in humans is rare in the USA, the disease accounts for more than 30,000 deaths annually worldwide.

Human Rabies Cases 2000-2003

Date of Death	State of Residence	Exposure History	Rabies Virus Variant
9-20-00	CA	Unknown	Bat, Tb
10-9-00	NY	Bite (Ghana)	Dog, Africa
10-10-00	GA	Unknown	Bat, Tb
10-25-00	MN	Bite	Bat, Ln/Ps
11-1-00	WI	Unknown	Bat, Ln/Ps
2-4-01	CA	Unknown (Philippines)	Dog, Philippines
3-31-02	CA	Unknown	Bat, Tb
8-31-02	TN	Unknown	Bat, Ln/Ps
9-28-02	IA	Unknown	Bat, Ln/Ps
3-10-03	VA	Unknown	Raccoon, Eastern USA

Human Rabies Cases 2003-2004

Date of Death	State of Residence	Exposure History	Rabies Virus Variant
6-5-03	PR	Bite	Dog/Mongoose, Puerto Rico
9-14-03	CA	Bite	Bat, Ln
2-15-04	FL	Bite	Dog, Haiti
5-4-04	AR	Bite (organ donor)	Bat, Tb
5-27-04	OK	Liver transplant recipient	Bat, Tb
6-7-04	TX	Kidney transplant recipient	Bat, Tb
6-10-04	TX	Arterial transplant recipient	Bat, Tb
6-21-04	TX	Kidney transplant recipient	Bat, TB
Survived	WI	Bite	Bat (Unknown)
10-26-04	CA	Unknown	Dog, El Salvador

Human Rabies Cases 2004

- In 2004 there were 8 human cases of rabies in the USA, the greatest number of deaths from the disease in several decades.
- Of these, 3 had known bite exposures (2 bats-US and 1 dog-Haiti), however, they did not receive medical treatment until after signs of the disease developed.
- Four cases were transmitted from an organ donor to recipients
- One case resulted from an unknown exposure to a dog in Guatemala

Human Rabies Cases 2004

- A Fond du Lac County, Wisconsin teenager was diagnosed with rabies on October 19, 2004
- The patient had a known bat bite
- Aggressive medical and antiviral treatment
- Patient survived

Rabies is the only major disease in which laboratory diagnosis of a disease in an animal directly effects human treatment

Prompt and reliable laboratory diagnosis of rabies is essential to patient post-exposure prophylaxis

Human Rabies Cases

Exposure (usually from contaminated saliva through animal bites)

Incubation ↓ 20-90 days

Prodromal symptoms (fever, chills, malaise, fatigue, insomnia, anorexia, headache, anxiety and irritability)

↓ Up to 10 days

Local Neurologic symptoms (pain, paresthesias, puritis, weakness)

↓

Classic (encephalitic) rabies symptoms -80% cases

Paralytic rabies -20% cases

No pathogenetic basis for the disease forms

Classic Rabies Symptoms

Include:

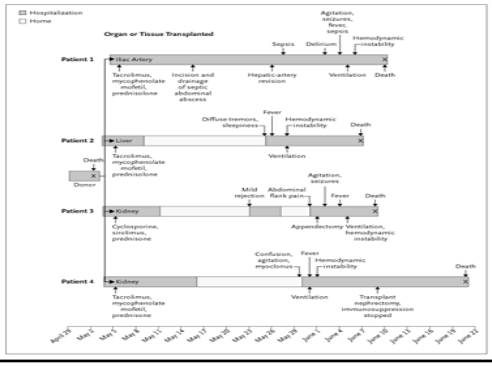
- Generalized arousal or hyper-excitability with intermittent lucid periods, including periods of confusion, hallucinations, agitation or aggressive behavior
- Autonomic dysfunction, hypersalivation, lacrimation, sweating, piloerection, and dilated pupils
- Cranial nerve dysfunctions, difficulty swallowing, facial or tongue weakness
- Hydrophobic spasms, aerophobic spasms
- Cardiopulmonary complications and instability – cardiac arrest and death

Paralytic Rabies Symptoms

Include:

- Flaccid muscle weakness frequently spread in ascending pattern to the other extremities.
- Laryngeal weakness (mute rabies)
- Facial muscle weakness- bilateral deafness
- Clinical picture may resemble Guillain-Bare' syndrome
- Sphincter involvement (urinary incontinence)
- Hydrophobia less common, mild inspiratory spasms
- It has been reported that in some cases less neutralizing antibody maybe present in humans with paralytic disease – further investigation is necessary
- Cardiopulmonary complications and instability – cardiac arrest and death

Transplant Rabies Cases



Rabies Prophylaxis

TABLE 4. Rabies postexposure prophylaxis guide – (ACIP) United States, 1999

Animal type	Evaluation and disposition of animal	Postexposure prophylaxis recommendations
Dogs, cats, and ferrets	Healthy and available for 10 days observation	Persons should not begin prophylaxis unless animal develops clinical signs of rabies. * Immediately vaccinate.
Skunks, raccoons, foxes and most other	Regarded as rabid unless animal proven negative by laboratory tests*	Consider immediate vaccination.
Livestock, small rodents, lagomorphs (rabbits and hares), large rodents (woodchucks and beavers), and other mammals	Consider individually.	Consult public health officials. Bites of squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, mice, other small rodents, rabbits, and hares almost never require antirabies postexposure prophylaxis.

*Begin prophylaxis at the first signs of rabies during the observation period. Euthanize and test the animal for rabies.
+The animal should be euthanized and tested as soon as possible. Discontinue vaccine if immunofluorescence test results of the

Rabies Prophylaxis
ACIP Recommendations Concerning Bats

Rabid bats have been documented in the 49 continental states, and bats are increasingly implicated as important wildlife reservoirs for variants of rabies virus transmitted to humans.

Recent epidemiologic data suggest that transmission of rabies virus can occur from minor, seemingly unimportant, or unrecognized bites from bats.

The limited injury inflicted by a bat bite (in contrast to lesions caused by terrestrial carnivores) and an often inaccurate recall of the exact exposure history might limit the ability of health-care providers to determine the risk of rabies resulting from an encounter with a bat.

Human and domestic animal contact with bats should be minimized, and bats should never be handled by untrained and unvaccinated persons or be kept as pets.

In all instances of potential human exposures involving bats, the bat in question should be safely collected, if possible, and submitted for rabies diagnosis.

Rabies Prophylaxis
ACIP Recommendations Concerning Bats

- Rabies postexposure prophylaxis is recommended for all persons with bite, scratch, or mucous membrane exposure to a bat, unless the bat is available for testing and is negative for evidence of rabies.
- Postexposure prophylaxis might be appropriate even if a bite, scratch, or mucous membrane exposure is not apparent when there is reasonable probability that such exposure might have occurred.
- On the basis of the available but sometimes conflicting information from the 21 bat-associated cases of human rabies reported since 1980, in 1-2 cases, a bite was reported; in 10-12 cases, apparent contact occurred but no bite was detected; and in 7-10 cases, no exposure to bats was reported, but an undetected or unreported bat bite remains the most plausible hypothesis. Clustering of bat-associated human cases within the same household has never been reported.
- Consequently, postexposure prophylaxis should be considered when direct contact between a human and a bat has occurred, unless the exposed person can be certain a bite, scratch, or mucous membrane exposure did not occur.
- In instances in which a bat is found indoors and there is no history of bat-human contact, the likely effectiveness of postexposure prophylaxis must be balanced against the low risk such exposures appear to present.
- In this setting, postexposure prophylaxis can be considered for persons who were in the same room as the bat and who might be unaware that a bite or direct contact had occurred (e.g., a sleeping person awakens to find a bat in the room or an adult witnesses a bat in the room with a previously unattended child, mentally disabled person, or intoxicated person) and rabies cannot be ruled out by testing the bat.
- Postexposure prophylaxis would not be warranted for other household members.

Rabies Prophylaxis

TABLE 5. Rabies postexposure prophylaxis schedule – (ACIP) United States, 1999

Vaccination status	Treatment	Regimen*
Not previously vaccinated	Wound cleansing	All postexposure treatment should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as a povidone-iodine solution should be used to irrigate the wounds (72).
	RIG	Administer 20 IU/kg body weight. If anatomically feasible, the full dose should be infiltrated around the wounds(s) and any remaining volume should be administered IM at an anatomical site distant from vaccine administration. Also, RIG should not be administered in the same syringe as vaccine. Because RIG might partially suppress active production of antibody, no more than the recommended dose should be given.
	Vaccine	HDCV, RVA, or PCEC 1.0 mL, IM (deltoid area+), one each on days 0&,3,7,14,and 28

Rabies Prophylaxis

TABLE 5. Rabies postexposure prophylaxis schedule – (ACIP) United States, 1999 (continued).

Vaccination status	Treatment	Regimen*
Previously vaccinated@	Wound cleansing.	All postexposure treatment should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as a povidone-iodine solution should be used to irrigate the wounds.
	RIG	RIG should not be administered.
	Vaccine	HDCV, RVA, or PCEC 1.0 mL, IM (deltoid area+), one each on days 0& and 3.

HDCV=human diploid cell vaccine; PCEC=purified chick embryo cell vaccine; RIG=rabies immune globulin; RVA=rabies vaccine adsorbed; IM, intramuscular.
*These regimens are applicable for all age groups, including children.
+ The deltoid area is the only acceptable site of vaccination for adults and older children. For younger children, the outer aspect of the thigh may be used. Vaccine should never be administered in the gluteal area. & Day 0 is the day the first dose of vaccine is administered.
@ Any person with a history of preexposure vaccination with HDCV, RVA or PCEC; prior postex-posure prophylaxis with HDCV, RVA, or PCEC; or previous vaccination with any other type of rabies vaccine and a documented history of antibody response to the prior vaccination.

Summary

- 7173 (animal) rabies cases occurred in US and Puerto Rico during 2003 (most current cumulative data). This was a reduction from 2002 in which there were 7970 total cases.
- Eight human rabies cases occurred 2004, of these 4 cases were acquired by organ transplantation.
- In 2004 recovery of a patient from clinical rabies was demonstrated after aggressive anti-viral treatment. The patient was a teenager from Wisconsin.
- Antigenic and molecular analysis of rabies viruses aid in molecular epidemiology and are useful in determining the rabies virus variant in cases of human rabies with unknown exposure histories.
- Human rabies cases are rare, and the unremarkable symptoms associated with the prodromal period of the disease, as well as the occurrence of the paralytic form may contribute to a diagnosis of rabies late in the clinical course or post-mortem.

Summary

- ACIP recommendations for prevention of rabies in humans 1999, outlines procedures for the disposition of animals (domestic and wild carnivores) and proper prophylaxis regimen.
- There are specific guidelines in the ACIP recommendations regarding bats. Bat exposures maybe unrecognized due to the small dentures.
- The majority of human rabies cases in the last 2 decades were bat associated.

Acknowledgements

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http://www.cdc.gov/ncidod/dvrd/rabies/